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LADYBIRD BEETLES AS PREDATORS OF THE POTATO PSYLLID*

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During the spring of 1933, an adult convergent ladybird beetle, *Hippodamia convergens* Guerin, was placed in a 3-dram homeopathic vial with a number of nymphs of the potato psyllid, *Paratrioza cockerelli* (Sulc). The ladybird immediately grabbed a psyllid nymph and began to eat it. Ten fifth-instar psyllid nymphs were eaten by this predaceous beetle during the one and one-half hours that it was caged with the nymphs. It was noted that moving nymphs were taken more quickly than those at rest, but the beetle showed no reluctance at taking the scale-like nymphs which were quietly feeding.

An adult female *H. convergens* was placed in a 3-dram vial with seven adult *P. cockerelli*. The beetle soon fell over on its back while grabbing an adult potato psyllid from the side of the vial. The predator fed upon its victim for one minute, while still resting upon its back; it then rolled over, fed for another minute, then walked off, leaving the psyllid victim. The ladybird had consumed all of the abdomen of the psyllid and bitten off the wings, but left the head and thorax almost untouched; this part crawled about. Two minutes later the predator returned and fed for two minutes upon the thorax of the same victim. Only a small portion of the thorax and the head remained uneaten; slight movements of the psyllid antennae occurred for another three minutes. Eleven minutes after taking the first *P. cockerelli*, a second specimen was captured. This time feeding continued for nine minutes. Seven minutes later a third psyllid was seized, and at the end of nine minutes of ravenous feeding only the wings and a small portion of the thorax remained. At the end of three hours, the seven adult *P. cockerelli* confined with the adult convergent ladybird beetle in the vial had all been killed.

Next day seven adult *P. cockerelli* were introduced into the vial with the same *H. convergens*. One was seized and its head and thorax eaten in four minutes. Another psyllid was captured almost immediately following and its head and thorax eaten within one-half minute. When these psyllids were all killed, seven more were added. Eleven psyllids had been killed and devoured at the end of four hours; 25 had been killed and eaten in five hours; and 45 *P. cockerelli* had been killed at the completion of seven hours of confinement in the vial. At least a part of each body was eaten, usually half or more. The greatest number of psyllids killed during any one hour of this day was 14. Immediately after the last psyllid was killed, seven new adults were each time introduced to take their place.

Next day, the same female *H. convergens* was confined in a 3-dram vial with adult potato psyllids always present; 15 psyllids were killed during the first hour, 10 the second, 9 during each of the third, fourth, and sixth hours, 18 during the fifth hour and four during the seventh hour of confinement, making a total

[1]Contribution from the Department of Entomology, Utah Agricultural Experiment Station. Publication authorized by Director.

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of 74 adult *P. cockerelli* destroyed during seven consecutive hours, or an average of 10.57 psyllids per hour. During this period of confinement the predator paused to deposit 10 eggs, the operation taking 7 minutes, during which time feeding did not take place; however, during this hour nine psyllids were dispatched, one being seized and fed upon within ten seconds after the last egg was deposited.

Upon the following day, under similar conditions, the same female *H. convergens* killed and ate an average of about half of each of 71 adult *P. cockerelli* in 8 hours; the greatest number taken during one hour being 17.

This ladybird beetle usually secured its prey by walking up close to a psyllid then quickly rushing up and seizing the *cockerelli* between its prothoracic tarsi. Another rather effective method was to stand partly propped up against the glass end of the vial; when a psyllid came close, it was secured by a quick upward lunge and held in a firm grasp. The beetle frequently fell over upon its back following such a plunge, but this did not cause the release of the victim. On several occasions feeding commenced while in this position.

Another *H. convergens* beetle, on a different occasion, killed and ate most of each body of 40 adult *P. cockerelli* in ten and one-half hours.

On August 21, three last instar larvae of *H. convergens* (reared from eggs deposited on August 9) were placed in 3-dram vials with adult *P. cockerelli*. One larva soon caught a potato psyllid and fed greedily for seven minutes; nothing but the wings and a small part of the thorax of the prey remained. At this time an intruding psyllid was quickly grasped by the hooks on the prothoracic legs of the larval predator; this psyllid was almost completely consumed in eight minutes. A third victim, captured almost immediately, was consumed in nine minutes. In this manner, six psyllids were killed and almost completely consumed by one larval *H. convergens* in one hour. During a period of eight hours, three larvae of *H. convergens,* confined in 3-dram glass vials, killed and ate about an average of half of each of 132 adult potato psyllids. In practically all cases the abdomen of the psyllid was eaten.

The larval *H. congergens* usually captured their adult psyllid prey by coming up close and quickly grasping the victim by means of the prothoracic legs, using the tarsal hooks to help hold the prey. The tibiae were also used at times in holding the psyllids during the feeding process.

Larvae of *H. convergens,* which were almost mature, were placed in vials with fifth instar *P. cockerelli*. One larval *H. convergens* killed and consumed all but a few fragments of most of the bodies of 25 scale-like potato psyllid nymphs in four hours.

One larval predator consumed all but a dorsal part of the exoskeleton of a fifth instar *cockerelli* in eight minutes, then darted at a second victim; the legs of the predator were not used in securing the prey, the beetle attempting to sink its mandibles into its victim as soon as it was reached. The mandibles at first scraped over the back without puncturing the psyllid, but after several attempts the psyllid body was punctured at the juncture of the thorax and abdomen. After feeding in this position for one minute the ladybird larva turned the psyllid over and fed upon it ventrally. In about half of the cases where readily accessible psyllid nymphs were fed upon, the *H. convergens* larvae commenced to bite into the victim without attempting to hold them by means of the legs. In other cases

the nymphs were grasped by the predator's tarsal hooks of the prothoracic legs, as was the case when adult psyllids were secured.

An adult *Hippodamia americana* Cr., in a 3-dram glass cage, seized an adult *P. cockerelli* and in three minutes consumed its abdomen. At the end of five minutes nothing remained of the psyllid except the wings. Another adult potato psyllid was seized and fed upon for twelve minutes, after which the fragments of the victim's body were dropped, and the ladybird walked away. Potato psyllid nymphs were readily eaten by adult beetles of this species.

An adult *Hippodamia lecontei,* var. *uteana* Csy., was placed in a 3-dram vial with seven adult potato psyllids. After wandering about for a short time it seized a psyllid resting on the curved side of the vial. The plunge of the beetle and the action of the psyllid caused the predator to roll on its back. Instead of righting itself immediately, it used all six tarsi to hold the psyllid and fed like a glutton for one minute, in which time it consumed all but the wings and a part of the thorax of the psyllid. At this time a psyllid hopped upon the inverted beetle. It was instantly grasped and feeding upon the new victim was begun. After feeding for two minutes, the ladybird rolled over, and holding the psyllid with its prothoracic tarsi much of the time continued to feed for a total of five minutes. Following this the fragments of the victim were dropped, and the beetle walked away. *H. lecontei* adults also fed readily upon potato psyllid nymphs.

Seven adult potato psyllids were caged in a 3-dram vial with an adult *Hippodamia quinquesignata* Kby. The ladybird soon captured a potato psyllid by use of the prothoracic tarsi and immediately began to feed upon the thorax of its prey. Only a few fragments of the psyllid remained at the end of four minutes. One specimen of *H. quinquesignata* fed upon and killed 49 adult potato psyllids in ten and one-half hours.

An adult *Hippodamia tredecim-punctata* (L.), caged with adult potato psyllids, killed and ate much of each of 46 adult *P. cockerelli* in ten and one-half hours.

Hippodamia americana Cr. fed upon both adult and nymphal potato psyllids when placed in a cage where these were present.

Adult and larval ladybird beetles of these species are often found in reasonable abundance upon potato plants wherever they are grown in Utah. It seems likely that these and other insect predators play a large part in reducing summer populations of *P. cockerelli.*

Two specimens of a small black and red *Hyperaspis* sp. did not feed upon either adult or nymphal *P. cockerelli,* although psyllid adults and nymphs of all sizes were made available to them.

THE PARASITES OF PSEUDOCOCCUS COMSTOCKI KUW.[1]

BY HAROLD COMPERE,

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Pseudococcus comstocki Kuwana is classed among the injurious mealybugs. It attacks a wide range of host plants. So far it has become abundant in the United States only in certain states east of the Mississippi River. In Con-

[1]Paper No. 281 University of California Graduate School of Tropical Agriculture and Citrus Experiment Station, Riverside, California.

necticut it has received the name catalpa mealybug, because of its injuriousness to that plant. It is recorded as attacking many food-producing plants, but so far it has not been rated as a serious pest of any commercial crop plants. *P. comstocki* has been recorded from California by G. F. Ferris, where it was taken on Monterey pines growing on the campus of Stanford University. Ferris also records this mealybug from a number of host plants, including citrus, collected in Japan by Dr. Kuwana. A lookout has been kept for the appearance of *P. comstocki* in southern California, as it is considered to be a potential pest of citrus.

This paper is for the purpose of calling attention to some natural enemies of *Pseudococcus comstocki,* in case there should be a necessity to attempt to control it by the biological method. Apparently there is a difference of opinion regarding the identity of the species called *Pseudococcus comstocki* in this paper. F. Silvestri recognized this species as *comstocki.* In his report on citrus scale insects of China, published in the Transactions of the Fourth Entomological Congress, he states: "This is the more common species of *Pseudococcus* on different species of citrus throughout the various provinces of China . . . . I never saw the species abundant except at one time at Peikuan, near Foochow on a pomelo near a tree badly infested with *Icerya;* and, like it, protected by strong colonies of *Polyrhachis dives.* I got one species of *Chalcididae* (*Anagyrus*), one of *Proctotrypidae,* and one of *Cedidomyidae* from specimens of this species; and saw preying on it species of *Scymini* and larvae of *Cecidomyidae.*"

In the spring of 1933, when the writer was in Japan en route to India, some specimens of mealybugs were taken on citrus at the Minatogawa Shrine in Kobe, and again at Suma, a resort near Kobe, in the garden of Sumitoma. In conversation, discussing the identity of this mealybug, Dr. Kuwana stated that he considered the common citrus-infesting species of Japan to be undescribed. The specimens collected in Japan appear to be identical with the species later collected in China and identified as *Pseudococcus comstocki.* C. P. Clausen, in his publications on the citrus insects of Japan, does not list *P. comstocki* but *Pseudococcus* sp., presumably on the advice of Dr. Kuwana. However, there is a possibility that neither Clausen nor Kuwana collected *comstocki,* but yet another species.

In regard to the identification of the species under discussion, G. F. Ferris has advised, "The mealybugs that you send are in my opinion perfectly typical *comstocki.* As you know, it is possible to confuse *comstocki* and *gahani* in slide preparations, they being more positively separable in living specimens. But I would not hesitate at all with these. We have the type slides of *comstocki* here." In life the Asiatic species appears unlike *gahani* and similar to the catalpa mealybug, *P. comstocki,* that occurs in eastern United States.

In China, *Pseudococcus comstocki* was taken by the writer on citrus from the following places: Canton, at Lingnan University, October 17, 1932; Swatow, November 2, 1932; Kolongsu, near Amoy, November 3, 1932; Tong Lok Yeun orchard near Fanling, New Territory, repeated collections during November and December, 1932. Except on several branches of three small trees in the Tong Lok Yeun orchard, no large colonies of this mealybug were seen. The large colonies of mealybugs had been almost entirely destroyed by predators and parasites at the time of departure from China, January 3, 1933, in spite of the fact

that ants swarmed over the infested twigs. The mealybugs were confined mostly to the inner surfaces of leaves matted together or otherwise protected. *P. comstocki* was seen in China under conditions which warrant the assumption that a satisfactory degree of natural control is maintained there by natural enemies.

Of the natural enemies reared from *Pseudococcus comstocki* in China, an undetermined species of *Diplosis* was the most abundant. Larvae and adults of *Scymnus bipunctatus* Kugel were present, but not abundant. Many hundreds of *Anagyrus subalbipes* Ishii issued from mealybugs collected in the orchard of Tong Lok Yeun. This species, as well as the *Diplosis*, readily reproduced in mealybugs growing on potato sprouts kept in glass battery jars in the hotel room. Occasional specimens of *Coccophagus pseudococci* n. sp. also issued from the material collected in Tong Lok Yeun's orchard. From material collected at Amoy, a single parasite was obtained, and at the time it was considered questionable whether this parasite issued from *P. comstocki* or from so-called *P. citri*. Upon comparison with the types, this parasite appears to be specifically identical with *Neodiscodes martinii* Comp., a species reared from a *Pseudococcus* taxonomically indistinguishable from *citri*, collected on *Olea chrysophylla*, at Nefasit, Eritrea. The failure of certain Eritrean parasites to develop in *P. citri* of California origin shows that more than one species of mealybug is confused under this name. Likewise, the failure of *Pauridia peregrina* Timb., the Asiatic parasite of so-called *P. citri*, to develop on California *P. citri* shows a confusion of taxonomically indistinguishable species. The knowledge that *Anagyrus subalbipes* Ishii is parasitic on *P. comstocki* in China strongly suggests that the same mealybug has been unrecognized in Japan, for *A. subalbipes* was described from one female reared from a *Pseudococcus* sp. collected on a citrus tree near Nagasaki, in 1922.

When in Australia, in 1930, searching for the citricola scale, Stanley E. Flanders collected some specimens of a *Pseudococcus* on *Acacia longifolia* and *Leptospermum*, which in life looked unlike *P. gahani*, but which in strained preparations appear indistinguishable from the latter. A parasite which issued from the Australian specimens collected by Flanders is described in this paper as *Tropidiophryne flandersi* n. sp., as it is believed that the Australian mealybug may be *P. comstocki*.

Coccophagus pseudococci n. sp.

This is the third species of *Coccophagus* recorded as parasitic on mealybugs. It is closely related to *C. javensis* Girault. *C. pseudococci* is most conveniently separated from *C. javensis* by color differences. The latter species has yellow axillae and a broad blackish band across the center of the yellow abdomen; while in *C. pseudococci* the axillae are blackish and the abdomen is predominantly black, with only the basal one-fourth or so yellow. In respect to abdominal coloration, *C. pseudococci* resembles *C. gurneyi* Compere, but otherwise these two species are strikingly different.

Female.—General color yellow with dark brown or blackish markings as follows: pronotum, narrowly on the anterior margin of the mesoscutum, a spot on the expanded part of the parapsides, axillae, tegulae, metanotum, propodeum, posterior half of the second and the following tergites. Face and cheeks lemon yellow, frontovertex and most of dorsum, ochraceous. Antennae ochraceous with

coarse dark sensoria. Legs and under parts pale yellow.

Pedicel about one and one-third times as long as wide and sub-equal to the first funicle joint in length. In the single balsam-mounted specimen, under high magnification, the second funicle joint appears a trifle longer than the first and third.

Mandibles with the apical and median tooth well developed, acutely pointed; the inner tooth apparently broadly rounded.

Scutellum large, wider than long (23:18) and as long as the mesoscutum. Abdomen broadly rounded at apex, cercal plates large.

Eyes distinctly setose. Mesoscutum with comparatively strong setae. The extended part of each parapsis with four setae about as large as those on the mesoscutum. Each axilla with two setae, the posterior setae about twice as long as the anterior setae. Scutellum with three pairs of setae, subequal in size and hardly much larger than the posterior axillar setae. Tergites with moderately strong setae.

Blackish anterior part of mesoscutum, spots on the parapsides and axillae with network reticulations. Sides of metanotum with strong striae and sides of propodeum faintly reticulated.

Basitarsus and tibial spur of middle legs equal in length, as long as the three succeeding joints. Hind tibiae with one long apical spur, the second spur no longer than the apical setae.

Fore wings hyaline, twice as long as wide; disk with moderately coarse cilia; a narrow, hairless area beneath the marginal vein separated by three or four rows of cilia from the basal hairless area. Marginal and submarginal veins subequal in length; postmarginal shortly produced as shown in figure.

Length, 0.75 mm.

Male.—Face, cheeks, antennae, under parts including legs, lemon yellow; frontovertex more or less dusky, remainder of thorax and abdomen mostly blackish.

Described from two females and six males (holotype, allotype, and paratypes). The holotype has been boiled and cleared, and the allotype not treated before mounting in balsam. The exact host relations of this species are not known. Male specimens were first observed November 26, 1932, in a breeding jar containing a lot of *Pseudococcus comstocki* Kuwana, collected on orange trees in the orchard of Tong Lok Yeun, at the 17 Mile Post, on the road to Fanling, New Territory, China. None of these specimens were killed for preservation but were kept for propagation. No females were discovered until a month later, when 12 females were observed in the jar. These females, except for 2 specimens saved for identification, and several males, were transferred to another breeding jar containing a supply of *P. comstocki*, the progeny of mealybugs collected at Amoy, China. This material, parasites and *P. comstocki* growing on potato sprouts, was destroyed at sea. A federal permit authorized the introduction of *Coccophagus* sp. into California for trial against *P. maritimus* Ehrhorn. Adult *Coccophagus* failed to issue before arrival at San Francisco and, since the authorization did not provide for the entry of *P. comstocki* into California, and as the parasitized mealybugs could not be segregated from the unparasitized mealybugs, the entire lot of material was destroyed.

Tropidiophryne flandersi n. sp.

This is the second species referred to this genus. All structural characters are quite like those of the genotype, except for the maculated wings. This species is strikingly different from *T. africanus* Comp. in coloration and presence of the maculated fore wings.

Female.—Entire body, head, antennae, and legs blackish except for the three intermediate tarsal joints of the middle and hind legs, which are white to light brown; the sculptured parts of head, thorax, and abdomen with metallic bluish-green reflections. Dorsum of head, pronotum, mesoscutum, axillae, and scutellum finely and closely punctate. The reticulations on the basal tergites form transverse areoles.

Frontovertex wider than in *africanus,* almost three-fourths the width of the head. Anterior ocellus three times its own diameter from the orbits.

Fore wings with infuscated areas set with short coarse dark setae, interrupted by hyaline patches with fine pale setae.

The wing venation, shape, and proportions of thorax and abdomen, and shape of wings, so far as can be seen, are similar to those of the genotype. The antennal proportions of the single specimen available for study cannot be exactly determined. The partly concealed foreshortened antennae appear, however, to be similar to those of *T. africanus.*

Described from 1 female (holotype) reared from a *Pseudococcus* alleged to be *comstocki* Kuwana, collected by Stanley Flanders on *Acacia longifola,* at Epping, New South Wales, March 13, 1931.

Types of new species to be disposited in the U. S. National Museum, Washington, D. C.

NEW SPECIES OF HYPOPHLOEUS (COLEOPTERA)

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The genus *Hypophloeus* contains a number of undescribed species but until the relation of certain forms as sexes has been established or disproved it is probably as well to refrain from describing species closely allied to *parallelus.*

The three following seem, however, to be so clearly distinct that they should be made known.

Hypophloeus subopacus sp. nov.

Size and Shape—Length 2.68 mm., width of body .92 mm., width of pronotum .81 mm. Somewhat stouter in build than *tenuis.*

Colour—Dull brown throughout, indefinitely darker on margins of abdominal segments; legs, palpi and antennae lighter.

Surface—Alutaceous above and below, but less shining above. Puncturation of head and pronotum moderately coarse, of same size, and rather dense for the genus. Elytral punctures finer and confused. Prosternum coarsely, quite closely and evenly punctured throughout, scarcely less so medially. Abdomen evenly, finely and not so closely punctured except last segment.

Pronotum—Truncate in front, apical angles nearly right, feebly blunt; marginal bead narrow but distinctly raised and slightly wider basally; hind angles obtuse but sharp, the apex of each a little prominent; sides almost evenly curved from apex

to about basal sixth where they are more rapidly sub-sinuate to basal angles; base evidently sinuate within the angles.

Holotype—Lorna, B. C., 23 VI. 1926, H. Richmond, from *Abies lasiocarpa*, 17173, Lot 3. In the Canadian National Collection.

Paratypes—Eight from Lorna, B.C., 30.VI to 12.VII, Trinity Valley, 20.VI to 21.VII, E. A. Rendall and Ralph Hopping, 17221, Lot 3. 17203, Lots 2, 3 and 14. From *Picea engelmanni*.

Besides the specimens mentioned above there are several others closely similar in all respects except in having a piceous pronotum. It is possible that the two forms may prove to be sexes of the one species.

Hypophloeus minor sp. nov.

Size—Length 2.14 mm., width of body .56 mm., greatest width of pronotum .49 mm. (Corresponding measurements of *tenuis*, Lec. Length 2.33 mm., width of body .69 mm., of pronotum .61 mm.)

Colour—Red brown, the head and pronotum a little browner than the labrum, clypeus and elytra. Below, almost concolourous with the elytra, the metasternum very slightly darker, coxae, legs, palpi, and antennae more yellow.

Shape—Parallel sided, the pronotum but little narrower than the elytra. Apex of pronotum truncate, apical angles obtuse and rounded. Sides of pronotum very feebly convergent basally and apically, almost parallel from about basal fourth so that the greatest width is scarcely noticeable in front of middle. Pronotal side margins very narrow, the lateral edge when viewed from the side nearly straight; basal angles very obtuse.

Surface—Shining, puncturation above, fine and subequal throughout; below, sides of prosternum more coarsely punctured, medial area of prosternum very feebly transversely rugose and with a few punctures. Mesosternum coarsely and shallowly punctured. Metepimera and sides of metasternum moderately coarsely punctured, the latter finely punctured medially. Abdomen finely and sparsely punctate except last segment which is rather coarsely punctured except on a narrow basal band.

Holotype—Edmonton, Alberta. 26. VIII. 15, F. S. Carr. In the Canadian National Collection.

Paratypes—Seven in the collections of Mr. Carr, Mr. C. A. Frost and myself. All the specimens were taken by Mr. Carr from the burrows of *Orthotomicus lasiocarpi*, or of *Neotomicus* sp. in *Larix*.

This little species is very close to *tenuis* Lec., and was sent to me as that. It differs in being smaller in all measurements. Its colour is more uniform and lighter, the thorax and head of *tenuis* approaching piceous and being distinctly darker than the elytra. Beneath, *minor* is much lighter in colour than *tenuis*. The thorax is more nearly parallel sided, the sides in *tenuis* being divergent from the base well past the middle so that the greatest pronotal width is more evidently farther forward than in *minor*. The basal pronotal angles are more obtuse than in *tenuis*. Below the puncturation of the prosternum is coarser, a trifle closer and more evenly distributed in *tenuis*, the medial area being almost as coarsely and closely punctured as the sides. The lateral pronotal edge seen from the sides is evidently arcuate basally in *tenuis*.

Hypophloeus occidentalis sp. nov.

Resembles *tenuis* in size and shape, though its pronotum is rather narrower and more nearly parallel sided. It differs by the more densely and coarsely punctured head and pronotum; by the colour of the upper side; head and pronotum piceous black, elytra brown basally, piceous brown in about apical third, the dark colour extending a little basally along the suture; and by the lateral edge of the pronotum being nearly straight, not feebly arcuate when seen from the side.

Holotype—Lorna, B. C., 1. VII. 1924, R. Hopping, from *Picea engelmanni*, 17203, Lot 3. In the Canadian National Collection.

Paratypes—Ten specimens from Lorna, B.C., dated from 30. VI. to 9. VIII. all from *P. engelmanni*, in the C. N. Collection, Mr. Hopping's collection and, through the kindness of Dr. McDunnough of Ottawa, in mine.

Some specimens which are without doubt this species differ from the holotype in having the pronotum alutaceous. This is probably a sexual character.

THREE NEW SPECIES OF APHIDS FROM IDAHO

BY FORREST W. MILLER.

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The species here described were collected by Walter R. Sweadner, Department of Zoology, University of Pittsburgh, during 1932. The writer is also indebted to Doctor E. H. Graham, Carnegie Museum, Pittsburgh, Pennsylvania, for the identification of the host plant material. The description of the several species are as follows:

Macrosiphum idahoensis n. sp.

(Figs. A-F)

ALATE VIVIPAROUS FEMALE.

Size and Color: Head, thorax light brown; abdomen green with faint brown patch posterior to cornicle. Cornicle deep brown. Cauda light green, being lighter in color than the abdomen. Entire antenna concolorous with the head. Coxa and basal half of femur of all legs concolorous with abdomen, remaining half of femur and all other leg divisions, dark brown to black. Beak dark brown. Stigma of fore wing light brown; region of anal veins similarly suffused.

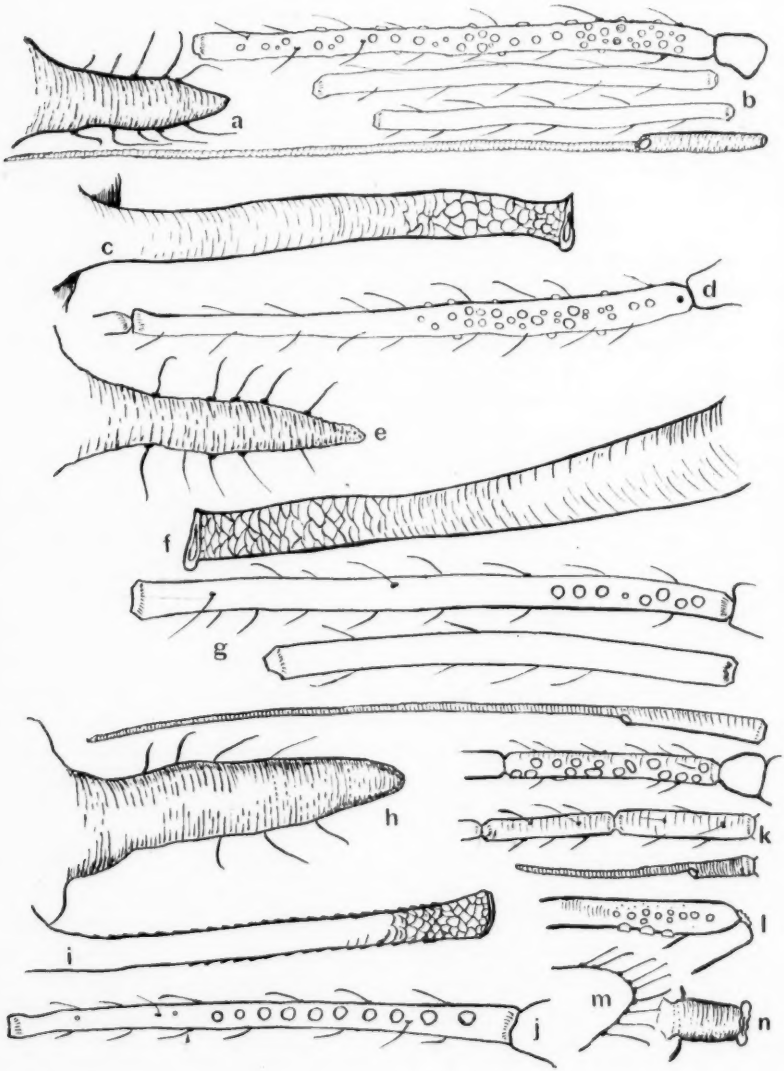
Head and Appendages: Average width of head across eyes, .506 mm. Comparative antennal lengths as follows: III-.89 to .93, average .91 mm.; IV-.70 to .74, average .72 mm.; V-.57 to .63, average .60 mm.; VI-.192 plus 1.06 mm. Secondary sensoria confined to the third segment, irregularly arranged and varying considerably in size, numbering from 47 to 55, average 51. Primary sensorium of segment VI with group of six small sensoria to one side. Beak extending beyond metathoracic coxa (.96 mm.).

Thorax and Appendages: Prothorax with lateral tubercles. Stigma long, pointed and narrow; second fork of median vein equidistant from first fork and the margin of the wing.

Abdomen: Cornicles .96 mm. long, not tapering, apex with closed reticulations .38 mm. long, slightly outcurved at the apex. Cauda .38 mm. long with six hairs to a side which are .096 mm. long.

APTEROUS VIVIPAROUS FEMALE.

Size and Color: Length from vertex to tip of anal plate, 2.32 mm. Color



Macrosiphum idahoensis n. sp. Fig. A—Cauda of alate female. B—Antenna, segments III-VI, alate female. C—Cornicle alate female. D—Antenna segment III apterous female. E—Cauda, apterous female. F—Cornicle apterous female.

Macrosiphum potentillicaulis n. sp. Fig. G—Antenna Segments III, IV and VI apterous female. H—Cauda alate female. I—Cornicle of alate female. J—Antenna III segment alate female.

Rhopalosiphum viridicaudus n. sp. Fig. K—Antenna segments III-VI alate female. L—Femur metathoracic leg alate female. M—Cauda alate female. N—Cornicle alate female.

same as in alate female except that the head and thorax are a much lighter brown. Tibia, in addition to femur, with only distal half darker brown in color.

Head and Appendages: Average width across eyes, .48 mm. Comparative antennal lengths as follows: III- .902 mm.; IV- .72 mm.; V- .58 mm.; VI- 1.02 mm. Sensoria numbering from 33 to 39 confined to swollen basal two-thirds of III. Beak is .891 mm. long extending well beyond meta-thoracic coxa.

Thorax and Appendages: There are no tubercles on the prothorax.

Abdomen: Cornicles .96 mm. long, apical .33 mm. with closed reticulations, remainder as in alate viviparous female. Cauda .42 mm., slightly constricted, six to seven hairs (.072 mm. long) to a side.

This form appears to be between *Macrosiphum erigeronensis* (Thos.) and *Macrosiphum zinzalae* (Hottes and Frison). It differs from *M. erigeronensis* in having a larger number of sensoria on segment III, from *M. zinzalae* in having shorter segmental lengths of the antenna and a smaller number of sensoria on segment III.

Holotype.—Alate viviparous female; Lookout Pass, Idaho, August 3, 1932, on *Anaphalis margaritacea.* Slide number S-A III.

Morphotype.—Same data as holotype.

Macrosiphum potentillicaulis n. sp.

(Figs. G-J)

ALATE VIVIPAROUS FEMALE.

Size and Color: Length from vertex to tip of anal plate, 2.89 mm. Head and thorax dark red, abdomen light red with 5-6 black patches located laterally. Cornicles black except for extreme basal region which is concolorous with the abdomen. Antennal segments I and II concolorous with the head, remaining segments black. Coxa, trochanter and basal half of femur light red, apical half of femur and rest of leg, black. Beak red except for IV plus V, which is black.

Head and Appendages: Width of head through eyes, .53 mm. Comparative antennal lengths as follows: III- .85 to .93, average .89 mm.; IV- .70 to .74, average .72 mm.; V- .70 to .74, average .72 mm.; VI- .144 plus 1.06 mm. Secondary sendoria limited to III, arranged in a straight row, averaging 16-18 in number and varying considerably in size. Hairs on the antenna short and stout. Primary sensorium on VI with six smaller sensoria grouped to one side. Beak very short (.096) failing to reach mesothoracic coxa.

Thorax and Appendages: Second fork of median vein only slightly closer to the edge of the wing than to first fork. All veins fail to reach wing margin.

Abdomen: Cornicles 1.01 mm. long, not tapering, .168 mm. of length with closed reticulations, well developed flange at apex.

APTEROUS VIVIPAROUS FEMALE

Size and Color: Length from vertex to tip of anal plate, 2.35 mm. Head, thorax and abdomen light red. Abdomen with double row of black patches located laterally. Antennal segments I and II are red with black suffusion near apical ends, III and basal half of IV are black, apical half of IV, entire V and VI segments are a deep red color. Legs are essentially as in alate viviparous female. Cornicles, cauda and anal plate also as in alate female.

Head and Appendages: Average width across eyes, .57 mm. Comparative antennal lengths as follows: III- .964 mm.; IV- .698 mm.; V- .747 mm.;

VI- .12 plus .67 mm. Secondary sensoria limited to basal half of III, in a straight row, numbering 6-8.

Thorax: There are no prothoracic tubercles.

Abdomen: Cornicles 1.06 long, apical .120 mm. with closed reticulations, distinct flange present. Cauda .554 mm. long with three to four hairs to a side.

Holotype.—Described from thirty-eight specimens collected at Pine Creek, Idaho, June 17, 1932, on *Potentilla Bakeri* Rydb. Slide number S-35-32.

Morphotype.—Same data as holotype.

Rhopalosiphum viridicaudus n. sp.

(Figs. K-N)

ALATE VIVIPAROUS FEMALE

Size and Color: Length from vertex to tip of anal plate, 1.90 mm. Head and prothorax light brown; thorax black. Abdomen pale green on ventral side, same on dorsal side except for a dark brown patch centrally located and three transverse brown bars located posterior to the cornicles, very small dusky brown spots located lateral and anterior to the cornicles. Cornicles dark brown to black. Cauda light brown to black with large centrally located green spot. Anal plate brown to black, first and second antennal segments concolorous with head, remaining segments light except base of III which is yellow. Coxa and trochanter slightly lighter in color than thorax; femur same color except lighter at extreme proximal end; tibia dark brown in middle half and lighter brown at the proximal and distal ends; tarsi dark brown. Beak yellow with segments IV plus V brown. Stigma and costa slightly lighter brown than the remaining wing veins.

Head and Appendages: Average width of head through eyes, .50 mm. Antennal segments with comparative lengths as follows: III- .36 to .40, average .38 mm.; IV- .8 to .22, average .20 mm.; V- .7 to .21, average .19 mm.; VI- .08 plus .27 mm. Secondary sensoria are arranged irregularly on III and number from 24 to 28 the average being 26.; from 0 to 2 sensoria are of IV. Beak extending to coxa of mesothoracic leg.

Thorax and Appendages: Median vein twice branched, the second fork .5 the distance of first fork to margin of the wing. Hind tibia .91 mm. long and with rather large tuberculate sensoria on proximal one-third of segment; tarsi .144 long, .024 mm. wide. Hairs longest on tibia (.024 mm.).

Abdomen: Cornicles .14 mm. long, swollen, being .06 mm. at the greatest width and .033 mm. at the constrictions (at base and below flange), imbricated throughout. Cauda with four lateral and two dorsal hairs, .09 mm. long. Lateral tubercles well developed.

APTEROUS VIVIPAROUS FEMALE (FUNDATRIX)

Size and General Color: Length from vertex to tip of anal plate, 2.07 mm. Head dark brown, thorax and abdomen light green to yellow. Dorsal region of abdomen spotted with light brown showing a concentration of this color in the mid-dorsal region. Cauda and anal plate brown. Antennal segments I and II concolorous with head; III concolorous with abdomen (green) and IV is dark brown. All the legs are dark brown.

Head and Appendages: Antenna with four segments which average as follows: III- .361 mm.; IV- .108 mm.; plus .072 mm. The antenna has a light colored sensoria-like area .265 mm. from the base of III. On the ungus of the

terminal filament there are six small sensoria arranged in circular fashion. Cornicles .144 mm. long, imbricated, with distinct flange at apex, conical, being .5 as wide at apex as at base (.096 mm. at base). Cauda not constricted, equal, in length to width of cornicle at the base.

This form comes closest to *Rhopalosiphum scrotinae*, Ostelund. However, segment III is longer, the base of VI is shorter, there is a greater number of sensoria on III, smaller on IV and none on V.

Holotype.—Described from thirty specimens collected at Pine Creek, Idaho, May 30, 1932, on *Amelanchier* sp. Slide number S-24-32.

Morphotype.—Same data as holotype.

NEW AND LITTLE KNOWN CANADIAN PARASITIC HYMENOPTERA (ICHNEUMONOIDEA)*

BY G. STUART WALLEY,

Ottawa, Ontario.

Cremastus (Zaleptopygus) brunneipennis n. sp.

Traces to section 27 (females) in Cushman's revision of the genus (Proc. U. S. N. M. Vol. 53, p. 513, 1917). Differs from *mordellistenae* Cush. in having the wings brownish and the face sub-equal in width to the eye length. Differs from *incompletus* (Prov.) in the brownish wings, the absence of pale orbital lines, broader stigma, broader radial cell and shorter metacarpus. Resembles *fuscipennis* Cress., but smaller with narrower face, eyes parallel within and abdomen wholly blackish. The male traces to section 13 (males) differing from the male of *mordellistenae* in the brownish wings, the absence of orbital rings and uniformly dark abdomen. From *incompletus* it differs in the brownish wings, broader ocellocular space which is slightly greater than the diameter of the lateral ocellus, and the lack of the orbital rings.

Female—Length 4.5 mm., antennae 3 mm., ovipositor sheath 1.75 mm. Head from above slightly more than twice as broad as long, temples strongly rounded; face almost as wide as the length of eyes, head minutely shagreened, finely punctured and slightly elevated in middle between antennae and base of clypeus; clypeus moderately elevated, separated from face, apical margin very broadly rounded; malar space four-fifths basal width of mandible; postocellar line nearly twice diameter of lateral ocellus, ocellocular line scarcely one and one-half times diameter of lateral ocellus.

Thorax rather stout, propodeum strongly arched scarcely reaching basal third of hind coxae, pronotum finely punctate, weakly crenulate along furrow; mesosternum and mesopleura densely punctate the latter above furrow shagreened and with a small polished area, metapleura uniformly densely punctate; notauli moderately defined, mesonotum shagreened obscurely punctate on lateral lobes; scutellum with well defined punctures; propodeum with well defined carinae, first lateral area very finely rugulose, areola, petiolarea and second lateral areas transversely punctato-rugulose; head and thorax with short dense silvery pubescence; stigma one-half as wide as long, radius arising slightly beyond the middle; second abcissa of radius straight, three times as long as first; basal vein broadly

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

curved; second recurrent postfurcal; nervulus very slightly beyond basal vein; nervellus weakly broken a little below middle; legs slender, hind basi-tarsus one-half as long as tibia, three-fourths as long as remainder of hind tarsus.

Abdomen one-third longer than head and thorax united; first tergite distinctly longer than second, its ventral margins subparallel and not enclosing the sternite, lateral foveae broad and extending to middle; post-petiole with sides parallel in apical two-thirds, gradually converging anteriorly; second tergite twice as long as basal width; post-petiole and second tergite evenly finely longitudinally striate; abdomen beyond with tergites finely shagreened.

Black; head black with clypeus and mandibles except tips brownish, palpi fuscous brown, antennae dark brown to black apically, the narrow apices of segments of basal half of flagellum dirty yellowish brown; thorax black, tegulae and narrow base of wing pale yellow; front and middle coxae and apices of hind coxae brown, remainder of hind coxae black; femora and tibia yellowish brown, the hind femora with median portion and hind tibia towards apex a little darker brown; tarsi pale fuscous brown. Wings brown, slightly paler towards apices; stigma brown with base narrowly dirty yellowish; veins brown; abdominal tergites black; sternites yellow; ovipositor black.

Holotype—♀, Chatham, Ont., Sept. 13, 1928, (A. B. Baird); No. 3621 in the Canadian National Collection, Ottawa.

Allotype—♂, Chatham, Ont., Aug. 30, 1928, (A. B. Baird).

Paratypes—4♀♀, 6♂♂, Chatham, Ont., Aug. 29-Sept. 13, 1928, (A. B. Baird). Paratypes in the United States National Museum.

Notes—In its brownish wings this species appears to resemble closely *fuscipennis* (Cr.) *and audax* Cr. From *fuscipennis* it differs as mentioned above while the male differs from *audax* in having the ocelli much smaller with the ocellocular line slightly greater than the diameter of the lateral ocellus.

In the series at hand the range in color is slight, the only variation noted being a slight brownish streak on the posterior orbit of the allotype and in a few of the paratypes the black color of tergites two and three is replaced by dark brownish, a little paler at the sutures.

Campoplex moderatus Vier.

Campoplex moderatus Vier., Can. Ent. LVII, 225, 1925.

I have a series of six males and five females, three of the males and all the females reared from *Exartema cornanum* Heinr., the other three males reared from a dark form of *Exartema permundanum* Clem. which feeds on *Myrica*. The parasites emerged at Bobcaygeon, Ont., June 17-July 14, 1932 (J. McDunnough). The females are slightly smaller but in color and structure are almost identical with the three females comprising the type series of *moderatus* Vier. which comes from the neighboring locality, Eldorado, Hastings County, Ont.

The above species described in *Campoplex* as restricted by Viereck, fails to trace to *Campoplex* in Viereck's arrangement of the subgenera because of the presence of an areolet. In his key to species all the specimens before me including the type fail to run to *moderatus* but fall under the second section of couplet I. In Schmiedekneckt's table of Campoplegine genera (Opuscula Ichneumonologica. IV, 1520, 1909) the species runs to *Idechthis*. The male which heretofore apparently has been unknown differs somewhat in sculpture and color from the

female. The following notes on both sexes based on the types and my reared series will supplement Viereck's original diagnosis of the species.

Female—Length 5-7 mm., sheath of ovipositor 1.5-2 mm. Head transverse, temples narrowed, sloping; ocellocular line equal or slightly less (in type very slightly less) than greatest diameter of lateral ocellus; inner margins of eyes slightly converging below, weakly emarginate opposite antennae; face two-thirds as broad as eye length; clypeus not separated at base, free margin evenly broadly rounded; malar space scarcely one-half basal width of mandible; head dullish, shagreened, face and front with fine granular sculpture; mesonotum dull, granularly sculptured; notauli weakly defined; pronotum and mesopleura more shining, finely granular except small polished spot below hindwing; pronotum with weak longitudinal rugae; mesopleura above with slight reticulate sculpture in front and a few rugae before polished area; metapleura evenly finely granular; propodeum with broad median longitudinal depression; areolated; areola and petiolarea confluent, the former finely granular, the latter with irregular transverse rugae; first lateral area large, finely granular; second narrower, weakly reticulately sculptured; coxae, postpetiole and abdominal tergites beyond, shagreened; body clothed with short pale yellowish hairs; radius broadly angulate; areolet small, petiolate; recurrent vein received much beyond middle; nervellus very broadly angulate near the posterior extremity.

Black, mandibles palpi and tegulae yellowish; bases of front coxae, middle coxae except apex, entire hind coxae and hind basal trochanters dark brown or black; legs pale reddish, apex of hind tibia above and less distinctly at base, apex of hind basi tarsi and beyond, pale fuscous.

Male—Length 4.5-6 mm. Differs in sculpture from the above in having the metapleura dull more coarsely granular above and weakly reticulately sculptured on lower half; the longitudinal propodeal carinae are stronger, more irregular, the areola and petiolarea narrower and their entire area together with second lateral area with strong irregular rugae.

In color the male abdomen is black with broad apical reddish bands on tergites two, three and sometimes four and in one specimen with the apex of the post petiole with a reddish spot; the hind tarsi are fuscous except at the extreme base.

Eclytus pleuralis (Prov.)

Orthocentrus pleuralis Prov. Nat. Can. VII, 328, 1875.

Four males of this species were bred at Bobcaygeon, Ont., June 29, 1932 (J. McDonnough) from a larva of *Acrobasis kearfottella* Dyar, found feeding on Hickory. The parasites emerged from four whitish cocoons averaging 6 mm. in length. The cocoons are of thinly spun silk, irregularly oval in shape and grouped on the upper surface of the leaf together with the remnants of the larval host, the entire mass covered and held in place by a delicate, loosely spun, silken web. In each case the parasite emerged through an irregular exit hole in the upper side near the end of each cocoon.

The males trace readily to *pleuralis* in Davis' paper (Trans. Am. Ent. Soc. XXIV, 305, 1897) and agree with his description of that species. They also agree with Provancher's original description which was based on two females, but not with the description of (*Mesoleptus*) *Eclytus decens* (Cress). ♀, which

species is treated by Dalle Torre, apparently following Provancher (Faune Ent. Can., II, 408, 1883) as a synonym of *pleuralis* (Prov.). Davis (1897) retains *pleuralis* Prov. as a valid *Eclytus* allowing *decens* to repose in *Mesoleptus*. Dalle Torre in error attributes *decens* to Davis instead of Cresson and tabulates it as a *Mesoleptus*. Following Davis I have identified my specimens as *pleuralis* (Prov.). In addition to the descriptions of color given by previous authors I present the following notes on the structure of the male, which may be of assistance in identifying the species.

Head large, broader than thorax, temples very broad, eyes small, face as broad as eye length; clypeus large, convex, free margin broadly rounded; malar space three-fourths basal width of mandible; head finely punctate; thorax more heavily punctured than head, especially on mesopleura; propodeum smooth, completely areolated, carinae well defined; areola rectangular, twice as long as broad; periolarea subquadrate, twice as broad as areola; metapleura finely punctate.

To Mr. R. A. Cushman I am indebted for pointing out to me the following two species which are apparently undescribed.

Smicroplectrus disseptus n. sp.

Female—Length 6.5 mm. Head large, slightly broader than thorax; temples broad, gradually sloping; postocellar line subequal to diameter of lateral ocellus, ocellocular line slightly less than twice diameter of lateral ocellus, ocelloccipital space one and one-half times ocellocular line; inner margins of eyes very weakly emarginate opposite antennae and very slightly diverging ventrally; face at widest point slightly narrower than length of eye, moderately elevated in middle below antennae; base of clypeus defined by an impressed line, free margin of clypeus broadly rounded; malar space two-thirds basal width of mandible; head shining, finely and sparsely punctured on vertex and behind eyes, more heavily punctured on face.

Mesonotum shining with fine sparse punctures; notauli well defined in front, weak behind; mesopleura shining, punctured below, polished and almost impunctate on upper half; metapleura shining, punctures poorly defined; propodeum strongly inclined beyond middle, the inclination accentuated by the strongly elevated carinae which form a blunt lateral tooth on either side at upper lateral angles of petiolarea, area of propodeum coarsely, somewhat transversely sculptured; areola small, subquadrate; legs slender, hind tibia as long as tarsus and as long as trochanter and femur combined; hind basi-tarsi slightly less than half hind tibia; areolet small, oblique, triangular, with short petiole; second recurrent vein near apex of areolet; nervulus almost interstitial with basal vein; nervellus inclivous, broken at posterior two-thirds.

Abdomen no broader than thorax; first tergite suddenly broadened immediately beyond base, thence with sides subparallel to apex, one-fourth longer than width at apex; median carinae strong, entire, parallel except where bordering the strong depression on the basal third of segment; lateral carinae entire, produced to form a distinct lobe at base of tergite; lateral margins of tergite reflexed, not visible from above; surface of tergite except at base coarsely, rugosely sculptured; second tergite subquadrate, irregularly rugose, the sculpture coarsest toward the base; gastrocoeli distinct, shining; third tergite finely rugose on basal third, punctate and shining beyond; following tergites finely punctured, shining,

with a narrow basal area obscurely rugulose.

Black; face anterior orbits opposite antennae, clypeus, cheeks below, mandibles except tips, palpi, spot on scape below, front and middle coxae and trochanters, prosternum, lower margin of pronotum, tegulae and minute spot before and larger spot beneath, stripe on front margin of mesopleuron below, margins of scutellum, small spot on apex of first tergite at middle, narrow apical margins of following tergites and lateral margins of tergites beyond third, white; flagellum black above, dirty yellowish white below, the pale color on the first and second segments reduced to a narrow line; legs reddish, base and apex of hind femur, hind tibia except obscure sub-basal reddish band, fuscous; hind tarsi black; apical segment of middle tarsus dark fuscous, the two adjoining segments pale brownish; stigma brown with small pale spot at base; veins brown.

Male—Resembles the female in form and color. Differs from the above in having the white markings on the thorax reduced in size, prosternum wholly black, hind coxae blackish below, hind tarsal trochanters blackish and middle tarsi wholly reddish.

Holotype—♀, Agassiz, B. C., July 22, 1921, (R. Glendenning); No. 3622 in the Canadian National Collection, Ottawa.

Allotype—♂, North Bend, B. C., May 17, 1919, (W. B. Anderson).

Paratypes—♂, same data as allotype; ♀, Victoria, B. C., July 18, 1899, (Rev. G. W. Taylor). Paratype in the United States National Museum.

Notes—The male paratype is smaller than the allotype and in color differs in having the hind femora uniformly brownish.

Ipoctonus conformis n. sp.

Female—Length 6.5 mm. Head broad, much broader than thorax, twice as broad as long; temples broadly rounded, as wide as the eyes; postocellar line slightly greater than diameter of lateral ocellus; ocellocular space almost twice diameter of ocellus; inner margins of eyes slightly converging ventrally; face at narrowest point equal in width to length of eye; clypeus poorly defined at base, elevated, free margin very broadly rounded; malar space one-third basal width of mandible; head finely shagreened with clypeus and posterior orbits almost smooth; face with fine scattered punctures and a minute median tubercle below antenna; antennae 29 segmented, second flagellar segment two-thirds length of first, none of flagellar segments less than twice as long as thick.

Notauli distinct on anterior half of mesonotum; mesosulcus well defined, deep posteriorly; mesonotum polished with poorly defined punctures bearing pale vestiture; mesopleura polished, impunctate above with a few scattered punctures bearing vestiture below; metapleura shining, obscurely punctate with a few fine rugae adjacent hind coxae; propodeum feebly rugulose with carinae broken, petiolarea feebly defined the lateral carinae forming same breaking up anteriorly to form several rugae, lateral areas united and divided only in part from pleural areas and areola. Nervulus slightly beyond basal vein; second abcissa of discocubitus one and one-half times as long as intercubitus; radius arising from middle of stigma; nervellus perpendicular, broken at posterior three-fourths.

Abdomen narrow at base, from above gradually broadened to apex of second segment, beyond with sides almost parallel; first tergite nearly twice as

long as apical width, two and one-half times as broad at apex as at base; spiracles elevated, situated a little beyond basal third; surface rugose with dorsal carinae extending from base to middle of tergite slightly converging posteriorly; chitinized sternite of first segment extending posteriorly to line drawn tangent to spiracles; second tergite finely rugose; third tergite and beyond shagreened, less distinctly towards apex of abdomen; sternites 2, 3, and 4 with median and lateral chitinized areas, sternites 5 and 6 chitinized except at intersegmental margins; sternite 6 twice as long as 5, subequal to apical truncature of abdomen; ovipositor sheath short, as long as second segment of flagellum.

Black; head black with face, clypeus, mandibles except tips, palpi, scape and pedical beneath, whitish; flagellar segments sordid brown above paler brownish beneath with apices dirty whitish. Thorax black with tegulae, small spot below, small stripe in front on prothorax joined above with larger stripe along margin of mesonotum, extreme bases of wings and apex of scutellum, whitish. Legs pale reddish with front and middle coxae, trochanters and apical hind trochanters whitish, the coxae flushed with pale reddish at bases, front and middle femora pale reddish, with paler apices; front and middle tibia and tarsi pale yellowish red, the apical segment of mid tarsus fuscous; hind coxae, basal trochanters and hind femora reddish; basal two-thirds of hind tibia pale yellowish white, tibial spurs white, apical third of hind tibia and hind tarsal segments blackish, the first two tarsal segments narrowly pale at base. Stigma and main veins dark brown, metacarpus entirely whitish. Abdominal tergites black, the apex of tergite two narrowly dirty yellowish, chitinized portions of sternites blackish, the apical margin of sixth sternite narrowly whitish.

Male—Resembles the female closely in sculpture and color, the apical segment of middle tarsus is scarcely darkened and the scutellum is more broadly whitish.

Holotype—♀, Turkey Point, (Norfolk County), Ontario, June 8, 1931, (G. S. Walley); No. 3623 in the Canadian National Collection, Ottawa.

Allotype—♂, Same data as holotype.

Paratype—♀, Fisher Glen (Norfolk County), Ontario, June 11, 1931, (G. S. Walley). Paratype in the United States National Museum.

Exenterus canadensis Prov.

Exenterus canadensis Prov., Pet. Faune Ent. Can. II, 796, 1883.

The writer has studied a series of twenty-nine specimens from Biscotasing, Ont., Laniel, Que., and Fredericton, N. B. The Biscotasing specimens were reared from *Neodiprion* sp. as were also the Laniel ones. In the Laniel region *Neodiprion swainei* Midd. was the common species and it is probable that the specimens were reared from this species. The two Fredericton specimens emerged from the cocoons of *Neodiprion lecontei* Fitch.

The species is closely allied to *nigrifrons* Rohwer which is known only from the type locality, Washington, D. C. I have examined the type of *nigrifrons* and find it to be a male, not a female as was stated in the original description. In my series of *canadensis* I have noted considerable variation in the amount of black on the face, the density of puncturation on the head and thorax and the coarseness of sculpture of the first two abdominal tergites. A male from Laniel has the black almost as extensive on the face as has the type of *nigrifrons* but the

tergites are not as coarsely sculptured as in the type. A Biscotasing male agrees with the type of *nigrifrons* in puncturation of head and scutum and sculpture of abdomen but differs in having the black on the face reduced to a narrow median stripe. I have not seen the type of *canadensis* Prov. but a homotype of *canadensis* in the United States National Museum differs from the type of *nigrifrons* as stated by Rohwer (Proc. U. S. N. M. 57, 225, 1920) and agrees with certain of my specimens of *canadensis*. It is possible that the two species are distinct and until further specimens are obtained from the Washington region and intermediate localities it appears unwise to pronounce them synonymous; accordingly I have provisionally distinguished them in the accompanying key.

Exenterus diprioni Rohwer

Exenterus diprioni Rohwer, Proc. N.S.N.M., 49, 222, 1915.
Exenterus affinis Rohwer, Proc. U. S. N. M., 57, 225, 1920, (New Synonymy).

The above synonymy is based on an examination of the types of *diprioni* and *affinis* and a series of five females and three males from Biscotasing, Ont. and Laniel, Que., reared from *Neodiprion* spp. One of the Laniel specimens was reared from the Jackpine sawfly, *Neodiprion swainei* Midd., but specific host records for the other specimens were not obtained.

In two of the females from Biscotasing the posterior face of the middle femur is marked with brown and in the three males both front and middle femora are bicolored, yellow in front and black behind. The sculpture of the second tergite is variable in my series and the types of both species fall within the range of variation.

A useful character for the separation of *diprioni* from allied species of *Exenterus* is found in the form of the tarsi. All the tarsi are noticeably shorter and stouter than in other species and the tarsal segments especially in the female are distinctly flattened.

Exenterus hullensis Prov.

Exenterus hullensis Prov., Add. Pet. Faune Ent. Can., II, 104, 1886.

Examination of the type specimens which are in the Canadian National Collection shows this species to be a true *Exenterus*. The presence or absence of teeth on the tarsal claws is not a good generic character. Some of the claws in the types have a few minute teeth close to the base of the claw. Better characters for distinguishing the genus are found in the body form, coarse sculpture, and form of the first abdominal tergite.

The following table is included for the separation of the North American species in this genus.

KEY TO SPECIES OF EXENTERUS

1. Propodeum uniformly sculptured; first and second tergites sculptured like the following ..... *lophyri* Vier.
   Propodeum more coarsely sculptured medianly than laterally; first and second tergites more coarsely sculptured than the following..... 2
2. Second tergite at base with well defined oblique impressions. . *hullensis* (Prov.)
   Second tergite at most only with poorly defined oblique impressions..... 3
3. Tarsi short and stout, front and middle tarsi especially stout and the segments noticeably flattened; front basi-tarsus of male three times as long as greatest diameter (in female slightly less than three times as long as greatest diameter) ..... *diprioni* Rohwer

Tarsi more elongate; front basi-tarsus of both sexes five to six times as long as greatest diameter..... 4

4. Vertex and scutum closely punctured; face usually mostly yellow with a narrow median black stripe.....*canadensis* Prov.
Vertex and scutum with distinct well separated punctures; face mostly black .....*nigrifrons* Rohwer

Macrocentrus cuniculus n. sp.

Traces to section 9 in Muesebeck's key to the Nearctic species (Proc. U. S. N. M., Vol. 80, Art. 23, p. 6, 1932) but distinguished from *peroneae* by its longer radial cell, narrower malar space, smaller eyes, broader face and by having the longest segment of the maxillary palpi distinctly shorter than the second flagellar segment. Resembles *harrisi* De Gant but with shorter malar space and larger eyes which extend ventrally below base of clypeus. Lacks the strong metapleural tooth of *pyraustae* Vier. and differs in color of abdomen and legs from that species.

Female—Length 5 mm. Head small, very slightly wider than thorax; eyes broadly oval, small; temples strongly receding; cheeks rounded; face broad, sparsely punctured, with a median impression above; clypeus small, weakly convex, truncate at apex; malar space at narrowest point only one-half basal width of mandible; ocelli larger and a little more prominently elevated than in *peroneae* ocell-ocular line one and one-half times as long as greatest diameter of lateral ocellus; maxillary palpi long, longest segment distinctly shorter than second flagellar segment; antennae longer than body, 45 segmented.

Propodeum delicately rugulose with extreme base and basal angles almost smooth; mesopleura sparsely punctate, metapleura with a few shallow punctures at base and finely rugulose apically; metapleural tooth weak; legs long, very slender; longer calcarium of hind tibia one-third the basitarsus; trochanters with apical teeth small; stigma large, broad, emitting radius from slightly beyond middle; radial cell long, measured along anterior margin more than one and one-half times length of stigma, ending a short distance before apex of wing, twice as long as broad; submedian cell closely hairy apically; nervulus post furcal by half its length; radiellan cell long, slightly widened apically.

Abdomen longer than head and thorax combined; first tergite finely longitudinally aciculate; second tergite distinctly longer than broad at apex also longitudinally aciculate as is the third except for apical third; remainder of dorsum of abdomen polished; ovipositor sheaths slender, length 8.5 mm.

General color black; head black, clypeus and base of mandibles brown; palpi dusky brown; scape and pedicel brownish flagellum dark brown at base becoming black apically; thorax blackish above, tinged with brown on pleura, paler brown on sides of pronotum; wings hyaline, veins and stigma brown, the latter very slightly paler at extreme base; legs brownish yellow, posterior tibia except narrowly at base and all tarsi dark brownish; abdomen dark brownish black.

Holotype—♀, Fredericton, N. B., June 15, 1931, (R. E. Balch); Experiment No. 18755-4; No. 3624 in the Canadian National Collection, Ottawa.

Paratype—♀, same data as type.

Host—The two type specimens were reared from the gallery of a pitch moth, possibly a species of *Evetria*, working in Jack Pine.

Dr. C. F. Muesebeck to whom I submitted the above species has kindly verified my conclusion that it is undescribed and through his kindness I have recently been able to compare my specimens with the type of *peroneae*.

THREE NEW SPECIES OF HYDROPORUS BELONGING TO THE VILIS GROUP. (COLEOPTERA).

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While, as Mr. Fall points out, the species of this group are rather closely allied, there seems to be a number of forms not yet described. Mr. W. J. Brown has recently described two species from British Columbia and the three treated in this paper seem clearly distinct.

The distinctions among the species are rather difficult to define, though, with the exception of certain forms of *vilis* and *planiusculus*, the differences may be seen clearly when specimens are at hand.

Hydroporus edwardsi sp. nov.

Narrowly elliptic oval, with length almost exactly twice the width, strongly depressed, surface strongly shining, very finely reticulate, even more so than *belfragei*. Almost non-pubescent, even the setae of the discoidal series of punctures being scarcely discernible. Head and pronotum very dark brown, the anterior margin of the former faintly paler, the lateral margins of the pronotum more evidently yellowish. Elytra yellowish brown, scarcely at all reddish, body beneath black, underside of pronotum, epipleura and appendages about the same colour as the elytra, joints of antennae very feebly infuscate at outer ends. Punctulation of head extremely minute, of pronotum and elytra larger but still unusually fine and quite sparse. The apical marginal row of punctures on the pronotum and one discal row on the elytra relatively well marked. Beneath unusually finely and sparsely punctulated and minutely alutaceous, the outer portions of the metasternal wings and the 1st abdominal segment with larger punctures.

Length 3.23 mm., width 1.60 mm.

Holotype. Grand Coulee, Grant Co., Washington, U. S. A., 2. IV. 33, O. T. Edwards, in my collection. There are three paratypes with the same data, two of which will be returned to Mr. Edwards.

This distinct species resembles most closely *belfragei* and the narrow forms of *planiusculus* in shape. Its size, its colour beneath and of head and pronotum, together with its extremely fine and quite sparse punctulation, render it easy to determine. Dedicated to Mr. Oliver Edwards of Pullman, Washington, who has found in the Grand Coulee a collecting ground of unusual interest.

Hydroporus browni sp. nov.

Evenly oval, the length a trifle over twice the width, evidently convex, more so than most species of the group; quite strongly, though finely, alutaceous above, only moderately shining. Head and pronotum piceous, the clypeal margin and the lateral pronotal margins vaguely paler; elytra brownish ferruginous, rather conspicuously darker in more than apical third. Punctulation of head extremely fine and quite sparse, of pronotal disk scarcely larger than on the head, the anterior sub-marginal band and the posterior marginal band, laterally,

with somewhat larger punctures; elytral punctures a little larger than those on pronotal base, moderately close, pubescence almost lacking. Side margins of pronotum wide, though scarcely as wide as those of *terminalis*. Body beneath black; metasternum, coxal plates, 1st abdominal segment, and 2nd laterally, evidently alutaceous, remainder of abdomen scarcely visibly so. Sides of metasternum, coxal plates, 1st abdominal segment and 2nd laterally shallowly and sparsely punctured with punctures coarser than those on the elytra; elsewhere very finely and sparsely punctulate. Legs ferruginous, the hind femora feebly infuscate. Antennae strongly infuscate, the four basal joints palest.

Length 2.65 mm., width 1.31 mm.

Holotype. Grand Coulee, Grant Co., Washington, 1 IV 33, O. T. Edwards.

Paratypes. Three, same data, varying only in depth of colour of the elytra and in the degree and extent of the apical shading.

This species is nearest *terminalis* but averages distinctly larger, is perhaps slightly more convex, the colour of the elytra is darker and less reddish, the side margins of the pronotum are scarcely as wide proportionately, and the antennae are even more infuscate. If the darkening of the elytral apex proves constant, that alone will be sufficient for identification.

The species is dedicated to Mr. W. J. Brown, of the Dominion of Canada Entomological Service, in recognition of his fine work on Coleoptera.

Hydroporus barbarensis sp. nov.

Rather broadly subovate, evidently convex, though less strongly so than *latebrosus*. Head piceous brown, feebly paler anteriorly, extremely finely alutaceous and very minutely punctulate, the punctules well separated; strongly shining. Pronotum piceous brown, paler laterally, and vaguely inwardly along both apical and basal margins; disk scarcely visibly alutaceous, even under high power, and very minutely and quite sparsely punctulate, baso-laterally the punctules are a little larger and form more or less oblique chains, giving a feebly rugose effect, though the surface between is still shining. The apical submarginal band of larger punctures is well marked and there are a few scattered, shallow, larger punctures basally. Side beading about as wide as in *vilis*. Elytra castaneous, plainly, though finely, reticulate, quite strongly shining, punctures very fine and sparse, one discal row of larger punctures and part of another basally, moderately well marked. Metasternum and coxal plates the colour of the pronotum, remainder of underside dark ferruginous. Mid-metasternum not, remainder of underside extremely finely alutaceous, strongly shining, very finely and sparsely punctured except on the metasternal wings, which are in part more coarsely, closely and confusedly punctured. Appendages all ferruginous, antennae not in the least infuscate.

Length 2.72 mm., width 1.50 mm.

Holotype.—Santa Barbara, California, F. E. Winters. In my collection through the generosity of the collector.

This seems to be a very distinct species for this group. Its broad convex form, its highly shining integuments, evidently alutaceous only on the elytra, its colour, its extremely fine punctulation and its non-infuscate antennae form a group of characters that should make identification easy.

Mailed Saturday, December 2, 1933.